

PRELIMINARY DATA SUMMARY

July 1992

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Measurements and Analysis work units at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height of 7.6 m above the National Geodetic Vertical Datum (NGVD) of the year 1929. In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Clifford F. Baron at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

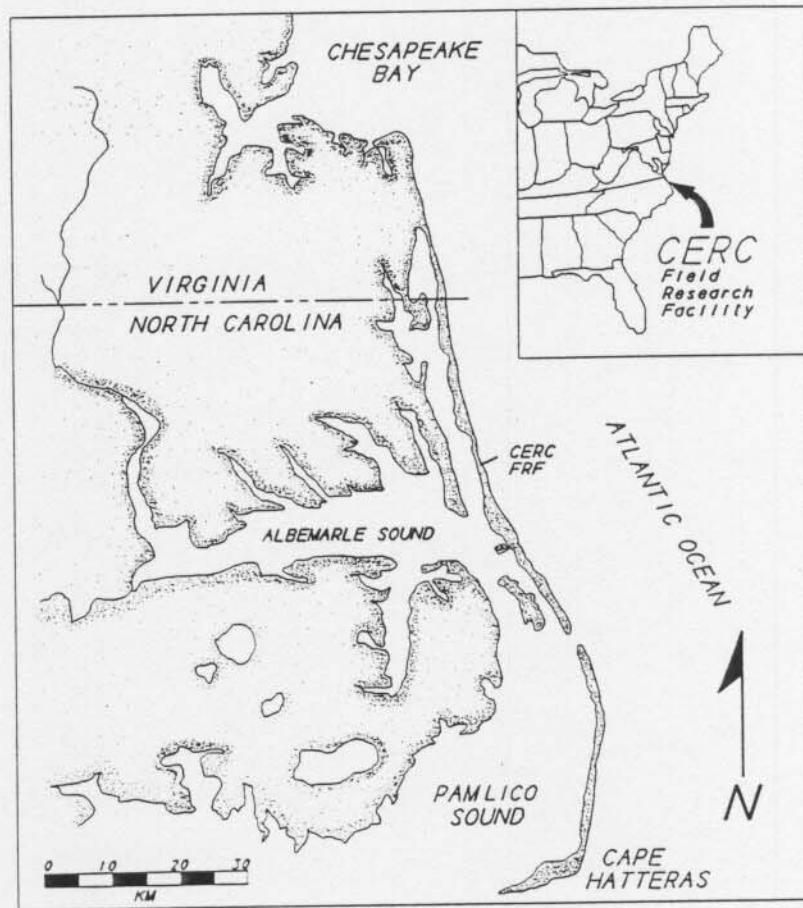


Figure 1. FRF Location Map

Table 1: Instrument Status/Data Availability

JULY 1992

Gage ID	Description/Remarks	Depth at Sensor		Day of the month																																
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1		
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	
932	Anemometer at seaward end of pier Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	
625	Baylor staff at station 18+60 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	
630	Waverider buoy 4.0 km offshore	Approx. 17 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-	/	*	*	*	*	*	*	*	*	*	*	*	
519	Current meter 320 m north of FRF pier (0.9 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*		
			Data Collected	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	
	Supplemental Observations (daily oceanographic and meteorological observations)		Daily observation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Gage Status

Operational = *

Partial = /

Non-Operational = -

Daily Observation

Complete = *

Partial = /

None = -

Data Collected

All = *

Partial = /

None = -

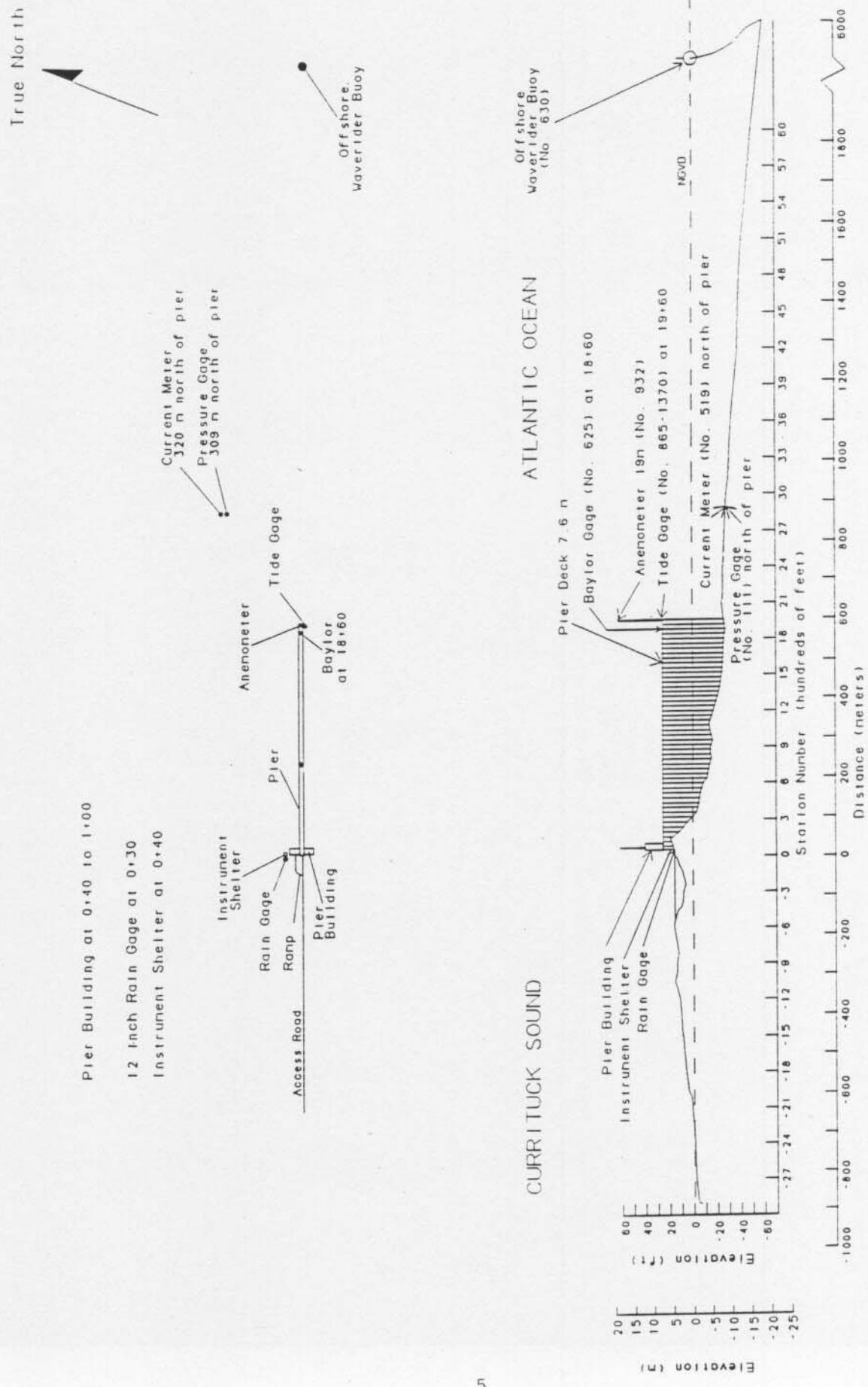


Figure 2. Instrument locations at FRF (all elevations from NGVD, all distances from FRF baseline).

PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 a log is maintained and the records are stored for future reference.

Winds were measured at the end of the pier at an elevation of 19 m (Figure 2) using a WeatherMeasure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Wind directions indicate where the wind is coming from. Temperature and atmospheric pressure means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -
 $mm \times .03937 = in.$
2. Millibars (mb) to inches of mercury (in. Hg) -
 $mb \times 0.02953 = in. Hg$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

Table 2: Meteorological Data

Jul 1992

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation
		Speed m/sec	Direction deg TN	deg C	mb	mm
1	100	3	206	24.2	1011.5	0
	700	5	214	25.9	1011.1	0
	1300	5	255	30.0	1009.7	0
	1900	4	204	25.5	1009.2	0
2	100	4	349	24.2	1008.5	0
	700	6	351	23.4	1009.5	0
	1300	7	359	25.4	1011.1	0
	1900	7	38	21.4	1012.3	0
3	100	6	68	20.9	1013.5	0
	700	5	86	22.5	1014.1	0
	1300	6	94	25.1	1014.7	0
	1900	6	162	24.2	1013.4	0
4	100	6	192	25.1	1012.8	0
	700	5	214	25.4	1013.2	0
	1300	6	204	26.0	1012.8	0
	1900	2	166	24.7	1011.9	0
5	100	3	266	26.4	1012.2	10
	700	2	22	25.3	1012.4	23
	1300	2	40	25.8	1011.8	0
	1900	6	143	25.3	1009.8	0
6	100	6	203	25.8	1008.9	0
	700	5	211	26.2	1008.5	0
	1300	4	77	25.2	1008.7	0
	1900	1	150	23.0	1009.1	0
7	100	3	289	23.1	1011.2	0
	700	1	349	24.1	1014.0	0
	1300	3	39	25.2	1014.7	0
	1900	3	41	23.8	1016.3	0
8	100	0		20.1	1017.7	0
	700	1	340	24.9	1018.8	0
	1300	4	126	26.7	1018.3	0
	1900	6	163	25.6	1016.5	0
9	100	7	205	26.0	1014.1	0
	700	8	229	26.5	1012.3	0
	1300	6	243	31.8	1011.3	0
	1900	4	237	30.3	1011.2	0
10	100	4	235	28.1	1011.8	0
	700	4	270	29.0	1013.3	0
	1300	3	121	33.0	1012.9	0
	1900	4	217	31.9	1012.0	0
11	100	6	231	28.7	1011.8	0
	700	5	254	29.4	1012.5	0
	1300	5	229	33.8	1012.5	0
	1900	3	137	28.0	1012.5	0
12	100	1	223	28.5	1013.4	0
	700	3	222	29.5	1014.5	0
	1300	5	132	32.8	1013.8	0
	1900	5	228	29.1	1012.7	0
13	100	9	223	28.5	1012.2	0
	700	10	241	28.4	1012.4	0
	1300	10	247	33.3	1011.5	0
	1900	3	250	31.4	1011.5	0
14	100	7	229	28.8	1012.2	0
	700	8	247	29.2	1012.9	0
	1300	6	246	34.6	1012.4	0
	1900	7	198	31.5	1009.6	0
15	100	9	229	28.9	1011.0	0
	700	9	234	28.1	1011.6	0
	1300	9	230	33.6	1010.1	0
	1900	9	205	30.0	1008.6	0
16	100	11	232	28.3	1010.8	0
	700	9	243	27.8	1013.5	0
	1300	7	242	32.3	1013.7	0
	1900	8	197	29.9	1013.6	0

* electronic problems

(Continued)

(Sheet 1 of 2)

Table 2: Meteorological Data

Jul 1992

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation
		Speed m/sec	Direction deg TN	deg C	mb	mm
17	100	8	229	27.2	1015.7	0
	700	8	225	27.1	1016.3	0
	1300	7	240	32.3	1016.3	0
	1900	9	203	27.2	1015.0	0
18	100	9	224	27.1	1016.1	0
	700	8	224	27.1	1016.3	0
	1300	7	219	32.0	1015.9	0
	1900	2	303	25.7	1016.2	0
19	100			Hardware Error		0
	700	7	223	26.5	1017.8	0
	1300	4	127	23.4	1017.2	33
	1900	8	117	21.5	1016.6	9
20	100	2	283	24.7	1016.5	0
	700	2	145	23.1	1017.6	0
	1300	5	142	24.8	1018.0	0
	1900	5	181	25.8	1016.3	0
21	100	5	227	25.4	1017.1	0
	700	4	233	26.4	1017.2	0
	1300	4	129	25.5	1017.2	0
	1900	6	203	26.7	1015.7	0
22	100	6	220	25.2	1017.5	0
	700	5	224	25.9	1018.1	0
	1300	3	120	26.5	1018.2	0
	1900	5	187	27.3	1017.3	0
23	100	5	231	25.8	1018.5	0
	700	4	224	25.7	1018.6	0
	1300	8	180	26.8	1017.7	11
	1900	8	215	25.6	1016.4	7
24	100	8	239	25.4	1017.3	0
	700	5	261	26.1	1017.9	0
	1300	6	83	23.4	1017.8	7
	1900	2	126	23.9	1017.5	7
25	100	3	50	20.8	1016.4	0
	700	4	62	20.9	1017.1	0
	1300	3	55	25.4	1016.6	0
	1900	6	67	22.0	1015.4	3
26	100	3	67	21.5	1014.8	0
	700	3	70	22.8	1014.7	0
	1300	5	128	25.2	1012.7	0
	1900	6	199	26.8	1009.9	0
27	100	6	223	26.4	1007.8	0
	700	6	250	27.1	1007.9	0
	1300	5	234	32.4	1006.9	0
	1900	4	297	28.8	1006.0	0
28	100	6	216	24.7	1006.6	14
	700	6	314	24.2	1008.7	5
	1300	7	20	24.9	1011.2	0
	1900	2	60	22.8	1011.8	0
29	100	3	170	21.6	1012.9	0
	700	5	214	25.2	1013.1	0
	1300	6	143	28.4	1013.2	0
	1900	6	184	26.4	1012.3	0
30	100	6	211	25.1	1013.5	0
	700	4	216	26.2	1014.2	0
	1300	7	145	27.6	1014.3	0
	1900	6	168	26.3	1013.8	0
31	100	5	190	25.3	1014.4	0
	700	7	184	26.7	1013.8	0
	1300	7	188	31.3	1012.3	0
	1900	7	189	28.1	1010.1	0
		Resultant		Mean	Mean	Total
		3	210	26.6	1013.5	129

* electronic problems

(Sheet 2 of 2)

PART III: WAVE DATA

Wave data are collected from a Baylor staff gage (Gage 625), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on optical disc using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 3 hr. The sampling rate is two times per second for five contiguous 34-min records. This report reflects the data collection periods of 0100, 0700, 1300, and 1900 EST. The results are based only on the first 34 minute record.

Wave height H_{mo} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to optical disc.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{mo} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, the presence of multiple wave trains containing nearly equal energy, and statistical variations in spectral estimations.

Table 3: Wave Data

Jul 1992

Day	Hour	625		111		630	
		Baylor	at 18+60	Pressure Gage	Tp.sec	Offshsr	Wvrdr
		Hmo,m	Tp.sec	Hmo,m	Tp.sec	Hmo,m	Tp.sec
1	0100	0.51	13.47	0.54	11.64	0.54	9.48
	0700	0.46	11.64	0.52	11.13	0.53	10.67
	1300	0.44	9.14	0.47	10.24	0.50	10.24
	1900	0.40	12.19	0.46	11.64	0.46	11.13
2	0100	0.36	11.64	0.41	10.67	0.41	11.13
	0700	0.41	11.13	0.44	11.13	0.55	11.13
	1300	0.56	11.64	0.55	7.31	0.71	7.31
	1900	0.93	5.12	0.96	5.12	1.31	5.22
3	0100	1.14	7.76	1.26	7.76	1.45	7.53
	0700	0.97	8.00	1.09	8.00	1.33	8.00
	1300	0.81	7.53	0.85	7.11	0.99	7.31
	1900	0.81	6.74	0.91	7.11	1.07	6.92
4	0100	0.62	9.14	0.75	9.48	0.85	9.85
	0700	0.70	8.83	0.82	8.26	0.89	8.83
	1300	0.62	8.83	0.72	9.48	0.81	9.48
	1900	0.59	8.53	0.70	7.76	0.71	5.82
5	0100	0.42	7.76	0.44	7.76	0.54	7.76
	0700	0.42	7.76	0.44	8.00	0.49	7.31
	1300	0.44	7.31	0.43	8.26	0.50	8.26
	1900	0.43	5.22	0.43	5.57	0.51	5.45
6	0100	0.35	7.31	0.33	9.48	0.46	7.53
	0700	0.28	7.76	0.34	7.31	0.38	8.53
	1300	0.35	8.83	0.37	8.53	0.45	4.83
	1900	0.32	8.00	0.35	7.76	0.42	5.33
7	0100	0.33	6.74	0.33	6.74	0.41	6.74
	0700	0.28	6.40	0.35	8.53	0.40	6.56
	1300	0.35	8.00	0.39	7.53	0.46	7.11
	1900	0.36	7.53	0.40	7.76	0.47	8.26
8	0100	0.36	6.92	0.43	6.92	0.52	7.31
	0700	0.33	6.92	0.43	7.11	0.48	7.11
	1300	0.35	7.31	0.40	7.11	0.49	6.56
	1900	0.48	3.46	0.46	6.92	0.73	3.66
9	0100	0.38	12.19	0.43	12.80	0.60	3.77
	0700	0.29	13.47	0.36	12.80	0.43	12.80
	1300	0.31	12.19	0.31	13.47	0.40	12.80
	1900	0.31	12.80	0.34	12.80	0.39	5.22
10	0100	0.29	8.83	0.34	8.83	0.41	8.53
	0700	0.32	8.83	0.33	7.53	0.37	7.11
	1300	0.31	8.00	0.39	8.53	0.42	7.76
	1900	0.33	8.53	0.38	8.26	0.41	8.53
11	0100	0.32	8.83	0.35	8.26	0.41	7.76
	0700	0.29	9.14	0.34	9.14	0.39	8.26
	1300	0.32	7.53	0.37	8.83	0.42	7.76
	1900	0.31	9.48	0.30	8.83	0.35	8.26
12	0100	0.32	8.26	0.33	8.83	0.39	8.83
	0700	0.28	8.83	0.30	8.53	0.37	8.83
	1300	0.29	7.76	0.31	9.14	0.36	8.53
	1900	0.28	9.14	0.28	8.83	0.32	8.83
13	0100	0.23	7.76	0.31	8.83	0.42	8.83
	0700	0.23	7.53	0.28	7.76	0.43	7.11
	1300	0.19	9.14	0.23	7.11	0.41	8.53
	1900	0.27	8.00	0.30	7.76	0.38	5.22
14	0100	0.21	7.76	0.26	8.53	0.36	7.31
	0700	0.20	8.53	0.21	8.53	0.27	7.53
	1300	0.18	7.53	0.25	7.53	0.31	7.76
	1900	0.35	3.88	0.35	3.77	0.48	5.33
15	0100	0.18	8.83	0.22	9.14	0.34	9.14
	0700	0.22	8.83	0.25	8.53	0.39	2.03
	1300	0.22	15.06	0.27	8.53	0.48	8.53
	1900	0.40	3.88	0.44	3.41	0.63	4.13
16	0100	0.19	15.06	0.26	7.53	0.47	2.21
	0700	0.25	15.06	0.29	15.06	0.39	7.11
	1300	0.30	6.92	0.33	8.00	0.43	6.92
	1900	0.34	13.47	0.36	7.76	0.57	4.74

* Electronic problems

(Continued)

(Sheet 1 of 2)

Table 3: Wave Data

JUL 1992

Day	Hour	625		111		630	
		Baylor	at 18+60	Pressure Gage		Offshr	Wvrdr
Hmo, m	Tp, sec	Hmo, m	Tp, sec	Hmo, m	Tp, sec	Hmo, m	Tp, sec
17	0100	0.29	14.22	0.28	13.47	0.40	7.31
	0700	0.33	14.22	0.34	13.47	0.47	5.45
	1300	0.35	14.22	0.37	8.26	0.51	5.69
	1900	0.36	14.22	0.38	13.47	0.58	6.24
18	0100	0.29	15.06	0.30	7.31	0.47	8.53
	0700	0.29	7.11	0.34	7.53	0.43	6.09
	1300	0.29	14.22	0.31	12.80	0.36	4.20
	1900	0.28	15.06	0.32	14.22	0.42	13.47
19	0100			Hardware Error		*	
	0700	0.32	14.22	0.34	13.47	*	
	1300	0.30	9.85	0.34	9.48	*	
	1900	0.35	8.83	0.38	8.83	*	
20	0100	0.42	8.83	0.50	8.53	*	
	0700	0.46	8.83	0.47	8.83	0.57	8.83
	1300	0.41	8.83	0.45	8.83	0.57	9.14
	1900	0.49	7.76	0.53	6.40	0.65	8.53
21	0100	0.39	8.83	0.46	8.26	0.55	6.92
	0700	0.36	7.31	0.41	8.00	0.45	7.31
	1300	0.36	7.31	0.39	8.00	0.47	8.53
	1900	0.39	8.26	0.39	8.26	0.48	6.74
22	0100	0.32	9.48	0.36	8.26	0.42	8.83
	0700	0.30	7.76	0.32	8.53	0.38	8.00
	1300	0.34	8.26	0.38	9.48	0.43	8.26
	1900	0.33	9.14	0.33	9.14	0.39	8.53
23	0100	0.32	8.83	0.33	7.76	0.41	8.26
	0700	0.53	5.82	0.58	5.95	0.76	6.24
	1300	0.45	8.26	0.42	5.95	0.62	6.09
	1900	0.25	7.76	0.30	7.53	0.36	7.76
24	0100	0.29	7.76	0.31	8.00	0.41	7.31
	0700	0.23	7.53	0.30	7.11	0.36	7.31
	1300	0.24	7.53	0.27	7.11	0.32	7.31
	1900	0.38	6.92	0.37	3.61	0.47	7.11
25	0100	0.60	4.57	0.62	6.92	0.75	6.74
	0700	0.58	6.92	0.65	6.09	0.83	5.57
	1300	0.78	6.24	0.84	5.69	1.04	6.24
	1900	0.59	8.53	0.66	8.26	0.82	7.76
26	0100	0.74	7.53	0.83	7.53	0.88	7.11
	0700	0.67	8.26	0.74	9.14	0.81	7.76
	1300	0.61	8.83	0.66	8.26	0.74	9.48
	1900	0.52	8.83	0.61	9.14	0.73	8.26
27	0100	0.53	9.14	0.57	9.14	0.59	9.48
	0700	0.43	8.83	0.57	9.14	0.61	8.83
	1300	0.46	9.48	0.47	9.48	0.49	9.14
	1900	0.46	9.14	0.47	9.48	0.55	9.14
28	0100	0.34	9.85	0.37	9.14	0.43	9.14
	0700	0.34	8.53	0.37	8.83	0.46	8.83
	1300	0.67	3.77	0.81	3.94	0.84	4.00
	1900	0.58	5.33	0.67	5.33	0.75	5.33
29	0100	0.32	9.48	0.43	8.83	0.50	8.53
	0700	0.38	9.14	0.45	5.12	0.52	4.83
	1300	0.28	9.48	0.38	9.14	0.48	8.83
	1900	0.31	8.83	0.38	9.14	0.44	9.14
30	0100	0.27	8.53	0.34	8.83	0.39	8.83
	0700	0.34	8.53	0.34	9.48	0.41	8.53
	1300	0.28	9.14	0.32	9.14	0.47	8.83
	1900	0.33	8.83	0.31	8.53	0.46	8.53
31	0100	0.24	8.53	0.31	8.26	0.35	8.83
	0700	0.35	9.48	0.32	8.83	0.47	8.26
	1300	0.37	8.83	0.39	3.61	0.51	3.82
	1900	0.45	4.34	0.51	4.66	0.65	4.57
Mean		0.40	8.90	0.44	8.48	0.54	7.59
Std dev		0.17	2.54	0.18	2.16	0.21	1.96

* Electronic problems

(Sheet 2 of 2)

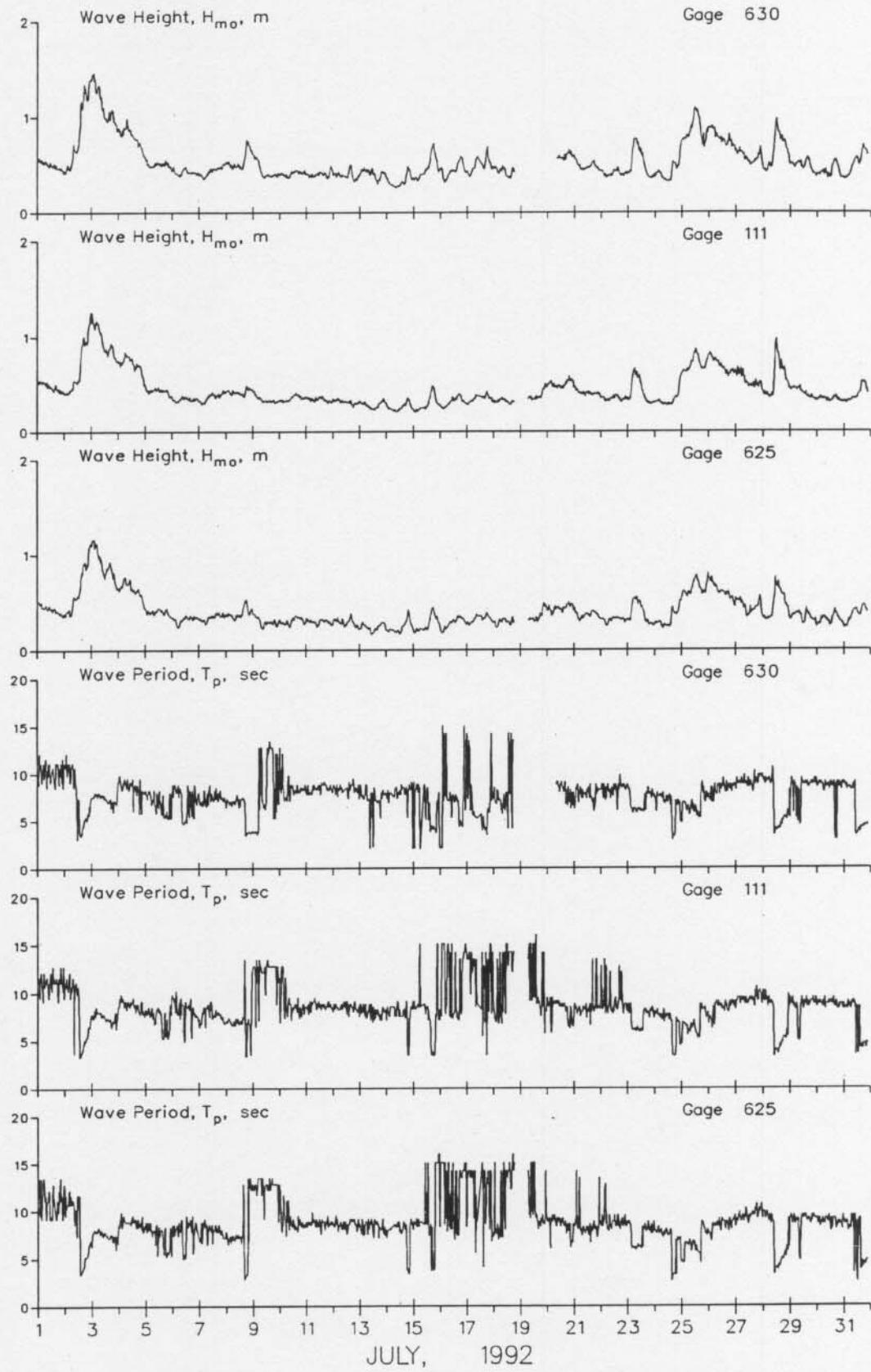


Figure 3. Time history of wave heights and periods

PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the cross-shore and longshore data. Current directions indicate the direction that the current is moving towards.

IMPORTANT NOTE

Direction resultants regarding the current meter data (gages 519 and 529) may be in error by minus 5 degrees due to a faulty compass reading. Please call us if you must use this data.

Table 4: Current Data
Jul 1992

Day	Alongshore Cross-shore Resultant Time	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter	
		Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	Speed	Dir
1 0100-Along										5	N	
Cross										5	on	
Result										7	296	
1 0700-Along	25	N				18	N			1	S	
Cross	10	off				4	off			3	on	
Result	27	2	140			18	354	South	31 N	3	235	
1 1300-Along										5	S	
Cross										3	off	
Result										6	133	
1 1900-Along										8	N	
Cross										3	off	
Result										8	3	
2 0100-Along										4	S	
Cross										7	off	
Result										8	98	
2 0700-Along	16	S				30	S			1	S	
Cross	2	on				0				1	off	
Result	17	166	140			30	160	North	11 S	2	137	
2 1300-Along										23	S	
Cross										23	off	
Result										33	115	
2 1900-Along										24	S	
Cross										14	off	
Result										28	130	
3 0100-Along										27	S	
Cross										17	off	
Result										32	128	
3 0700-Along	23	S				28	S			20	S	
Cross	6	on				17	on			10	off	
Result	24	174	152			32	191	North	36 S	22	133	
3 1300-Along										21	S	
Cross										3	off	
Result										21	153	
3 1900-Along										1	S	
Cross										3	on	
Result										3	235	
4 0100-Along										1	S	
Cross										3	off	
Result										3	91	
4 0700-Along	23	N				16	N			7	N	
Cross	6	off				14	off			4	on	
Result	24	354	154			21	22	South	19 N	8	314	
4 1300-Along										7	S	
Cross										5	off	
Result										8	124	
4 1900-Along										2	N	
Cross										5	on	
Result										5	271	
5 0100-Along										4	S	
Cross										3	off	
Result										5	126	
5 0700-Along	17	N				29	N			1	S	
Cross	0					3	on			1	on	
Result	17	340	138			29	334	South	13 N	1	201	
5 1300-Along										17	S	
Cross										7	off	
Result										18	136	
5 1900-Along										3	S	
Cross										3	on	
Result										4	203	

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Continued)
Jul 1992

Day	Time	Pier Measurements				Beach Measurements			Current Meter	
		Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519
6	0100-Along Cross Result							4	S	
								3	on	
								5	196	
6	0700-Along Cross Result	0 9 9	off 70	140	44 0 44	N 340	South	4	N	
								3	S	
								4	off	
								5	110	
6	1300-Along Cross Result							27	S	
								11	off	
								29	138	
6	1900-Along Cross Result							3	N	
								1	off	
								3	6	
7	0100-Along Cross Result							1	N	
								1	off	
								1	19	
7	0700-Along Cross Result	16 5 16	S on 177	165	17 0 17	N 340	South	9	N	
								1	S	
								6	off	
								6	77	
7	1300-Along Cross Result							11	S	
								8	off	
								13	122	
7	1900-Along Cross Result							18	S	
								9	off	
								20	134	
8	0100-Along Cross Result							21	S	
								7	off	
								22	141	
8	0700-Along Cross Result	36 0 36	S 0 160	165	25 0 25	N 340	South	14	N	
								10	S	
								10	off	
								14	117	
8	1300-Along Cross Result							10	S	
								5	off	
								11	133	
8	1900-Along Cross Result							4	S	
								0		
								4	160	
9	0100-Along Cross Result							7	N	
								1	on	
								7	333	
9	0700-Along Cross Result	36 9 37	N off 354	165	12 11 16	N off 22	South	15	N	
								7	N	
								1		
								7	340	
9	1300-Along Cross Result							6	N	
								3	on	
								6	311	
9	1900-Along Cross Result							2	S	
								0		
								2	160	
10	0100-Along Cross Result							2	N	
								1	on	
								2	318	
10	0700-Along Cross Result	11 7 13	N off 11	152	47 9 48	N off 351	South	21	N	
								7	S	
								0		
								7	160	
10	1300-Along Cross Result							1	N	
								1	on	
								1	304	
10	1900-Along Cross Result							2	N	
								1	off	
								3	14	

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Jul 1992

Alongshore Cross-shore Resultant Time Day	Pier Measurements						Beach Measurements			Current Meter	
	Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface)		(500m Updrift)			Dye 12m offshore (surface)		0.9 km Offshore Depth -5.6m (NGVD) ID #519	
	Speed	Dir	Distance from Baseline (m)	Speed	Dir	Location	Speed	Dir	Speed	Dir	
11 0100-Along Cross Result				41	N				4	N	
11 0700-Along Cross Result	13 8 15	N off 11	165	0 41	N 340	South	24	N	1	on	
11 1300-Along Cross Result									4	325	
11 1900-Along Cross Result									6	S	
12 0100-Along Cross Result									1	off	
12 0700-Along Cross Result	10 1 10	S off 154	152	44 7 44	N off 349	South	21	N	6	150	
12 1300-Along Cross Result									10	S	
12 1900-Along Cross Result									5	off	
13 0100-Along Cross Result									11	135	
13 0700-Along Cross Result	0 10 10	— off 70	140	41 0 41	N off 340	South	16	N	2	N	
13 1300-Along Cross Result									1	on	
13 1900-Along Cross Result									3	308	
14 0100-Along Cross Result									4	off	
14 0700-Along Cross Result	5 6 8	S off 109	140	32 10 33	N on 323	South	25	N	7	359	
14 1300-Along Cross Result									17	S	
14 1900-Along Cross Result									4	off	
15 0100-Along Cross Result									18	148	
15 0700-Along Cross Result	6 7 9	N off 31	140	12 7 14	N off 11	South	5	N	5	S	
15 1300-Along Cross Result									1	off	
15 1900-Along Cross Result									3	146	

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Table 4: Current Data (Continued)
Jul 1992

Alongshore Cross-shore Resultant Time Day	Pier Measurements						Beach Measurements			Current Meter	
	Dye at (579 m) (surface)		Distance from Baseline (m)		Dye 12m offshore (surface)		(500m Updrift)		Depth -5.6m (NGVD) ID #519	0.9 km Offshore Depth	
	Speed	Dir			Speed	Dir	Location	Speed	Dir	Speed	Dir
16 0100-Along Cross Result										3	N
16 0700-Along Cross Result	6 6 9	N off 25		140	5 5 7	N off 25	South	3	N	7	on
16 1300-Along Cross Result										8	274
16 1900-Along Cross Result										3	N
17 0100-Along Cross Result										1	N
17 0700-Along Cross Result	20 12 24	N off 11		140	15 4 15	N off 354	South	5	N	1	S
17 1300-Along Cross Result										5	on
17 1900-Along Cross Result										5	237
18 0100-Along Cross Result										1	N
18 0700-Along Cross Result	22 13 25	N off 11		152	30 8 31	N off 354	South	5	N	2	on
18 1300-Along Cross Result										2	282
18 1900-Along Cross Result										14	N
19 0100-Along Cross Result										5	on
19 0700-Along Cross Result	12 12 17	N off 25		140	13 3 13	N on 326	South	0		15	320
19 1300-Along Cross Result										6	N
19 1900-Along Cross Result										6	on
20 0100-Along Cross Result										9	295
20 0700-Along Cross Result	23 7 24	N on 323		163	24 7 25	N off 357	South	28	N	0	297
20 1300-Along Cross Result										0	
20 1900-Along Cross Result										3	S
										3	off
										4	121

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on = onshore off = offshore

Table 4: Current Data (Continued)
Jul 1992

Alongshore Cross-shore Resultant ---- Time Day	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter	
	Dye at (579 m) (surface)	Distance from Baseline (m)	Dye at Mid-Surf Zone (surface)	Location	Dye 12m offshore (surface)	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	Speed	Dir	
21 0100-Along Cross Result									4	S	
21 0700-Along Cross Result	7 7 11	N off 25	152		44 11 45	N off 354		36 N	0		
21 1300-Along Cross Result								South	4	160	
21 1900-Along Cross Result									3	N	
22 0100-Along Cross Result									1	off	
22 0700-Along Cross Result									3	360	
22 1300-Along Cross Result									3	S	
22 1900-Along Cross Result									6	off	
23 0100-Along Cross Result									4	on	
23 0700-Along Cross Result	38 0 38	N on 340	165		13 3 14	N on 326		11 N	7	307	
23 1300-Along Cross Result								South	6		
23 1900-Along Cross Result									4		
24 0100-Along Cross Result									7		
24 0700-Along Cross Result	15 15 22	S off 115	165		0 5 5			31 N	2	160	
24 1300-Along Cross Result								South	3	N	
24 1900-Along Cross Result									3	off	
25 0100-Along Cross Result									4	on	
25 0700-Along Cross Result	28 0 28	S on 160	165		19 6 20	S on 177		75 S	4	48	
25 1300-Along Cross Result								North	12	S	
25 1900-Along Cross Result									9	off	

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Table 4: Current Data (Continued)
Jul 1992

Alongshore Cross-shore Resultant ---- Time	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter	
	Dye at (579 m) (surface)	Distance from Baseline (m)	Dye at Mid-Surf Zone (surface)	Location	Speed	Dir	Dye 12m offshore (surface)	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	
Day	Speed	Dir									
26 0100-Along Cross Result										17 10 19	
26 0700-Along Cross Result	34 0 34	S on 160	165	North	25 3 26	S on 166	13	S	25 10 27	S off 130	
26 1300-Along Cross Result										9 4 10	
26 1900-Along Cross Result										5 1 5	
27 0100-Along Cross Result										7 6 10	
27 0700-Along Cross Result	12 12 17	N off 25	165	North	13 10 16	N off 17	0		3 0 3	S 160	
27 1300-Along Cross Result										13 9 16	
27 1900-Along Cross Result										7 4 8	
28 0100-Along Cross Result										4 4 6	
28 0700-Along Cross Result	68 0 68	S on 160	152	North	25 0 25	S on 160	17	S	14 7 16	S off 133	
28 1300-Along Cross Result										29 21 36	
28 1900-Along Cross Result										30 14 33	
29 0100-Along Cross Result										16 6 17	
29 0700-Along Cross Result	11 6 12	S off 133	151	South	9 2 10	N on 326	5	N	19 6 20	S off 142	
29 1300-Along Cross Result										7 1 7	
29 1900-Along Cross Result										0 0 0	
30 0100-Along Cross Result										3 0 3	
30 0700-Along Cross Result	23 6 23	N off 354	140	South	13 7 15	N off 7	32	N	2 1 2	N off 7	
30 1300-Along Cross Result										13 6 15	
30 1900-Along Cross Result										2 2 3	

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on = onshore off = offshore

Table 4: Current Data (Concluded)
Jul 1992

Alongshore Cross-shore Resultant ---- Time Day	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter	
	Dye at (surface)	Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Location	Dye 12m offshore (surface)	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	
31 0100-Along Cross Result										3 6 6	
31 0700-Along Cross Result	47 0 47	N 140 340		55 0 55	N 340	South	76 N	1 0 1	S off 97	160	
31 1300-Along Cross Result										4 1 4	
31 1900-Along Cross Result										7 6 9	
										N on 297	

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves) are taken daily at the seaward end of the pier. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests at approximately the same location as the visual measurements. The pier axis (considered perpendicular to the beach at the FRF) is oriented 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are also taken daily at the seaward end of the pier. A Bucket Thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The temperature is then read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the depth of visibility.

Table 5: Supplemental Observations

Jul 1992

Day	Time	Wave Approach		Radar Wave Angle deg from True N	Width of Surf Zone, m	Water Characteristics at Pier End		
		Primary	Secondary			Temp., C	Density g/cc	Secchi Vis., m
1	0755	145			12	19.4	1.0226	2.7
2	0800	10		105	23	21.7	1.0220	3.0
3	0820	40		50	82	22.2	1.0196	2.1
4	0900	120			55	21.7	1.0206	3.0
5	0930	120			15	22.8	1.0208	3.0
6	0815	135			17	17.2	1.0236	1.5
7	0800	125			29	23.9	1.0208	6.1
8	0810	100			41	23.9	1.0195	3.0
9	0815	135			5	20.0	1.0223	3.0
10	0745	130			20	20.0	1.0224	4.6
11	0845	110			21	18.9	1.0232	4.3
12	0845	120			50	25.0	1.0200	2.4
13	0720	130			14	15.0	1.0245	2.7
14	0745	150			2	15.6	1.0242	3.7
15	0750	130			5	16.1	1.0242	3.7
16	0800	110			5	15.0	1.0244	4.3
17	0800	95			5	14.4	1.0243	5.2
18	0950	110			11	15.0	1.0246	3.7
19	0940	135			8	15.6	1.0246	3.4
20	0750	120			12	16.7	1.0236	5.2
21	0830	115			14	16.7	1.0246	3.7
22	0815	125			8	17.2	1.0245	4.0
23	0845	130	10	inoperative	29	17.8	1.0238	3.4
24	0830	140			10	15.0	1.0242	3.7
25	0845	15			44	19.2	1.0233	5.5
26	0900	40			81	23.9	1.0198	3.4
27	0745	140			27	16.1	1.0234	3.0
28	0740	90			15	21.7	1.0225	3.7
29	0740	25	150		11	23.3	1.0192	3.4
30	0750	135			6	21.7	1.0220	2.4
31	0800	100		120	11	18.3	1.0240	2.7

PART VI: WATER LEVELS

Since 1978, the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) has operated a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect instantaneous water level data every 6 minutes throughout the month.

The variation in water level during the month is shown in Figure 4 along with a list of mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water level.

Table 6 contains the time at the center of each 12.42-hr tidal cycle and the range, high, low, and mean water levels during each tidal cycle.

FRF Tide Heights

Jul 1992

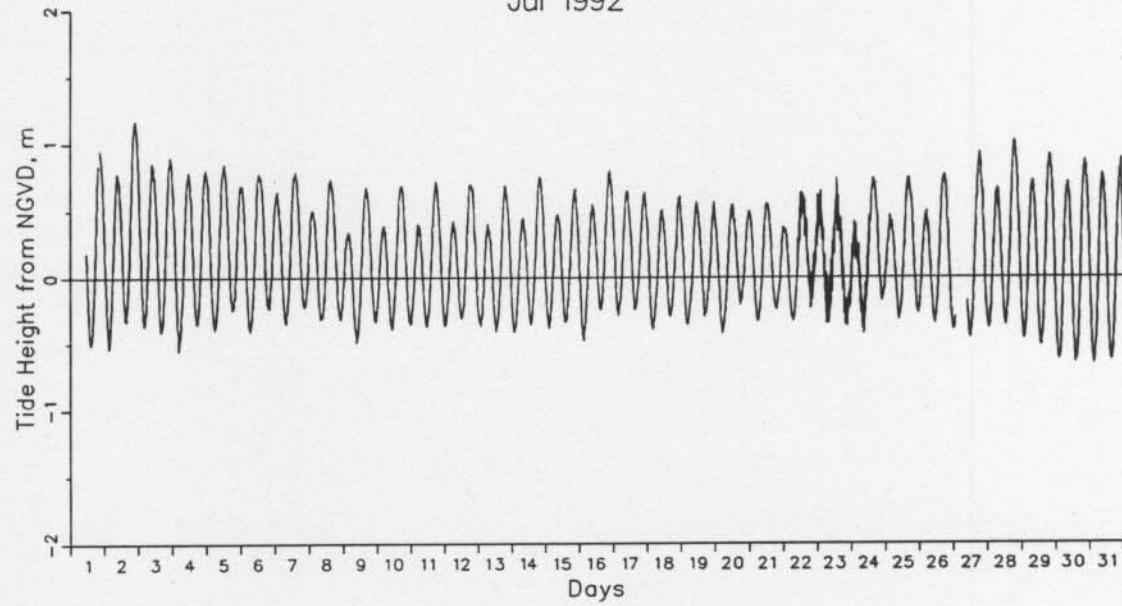


Figure 4. Water level time history

Monthly Water Levels,m NGVD

Extreme Low = -0.65 on day 31 at 200 EST
Extreme High = 1.17 on day 2 at 2112 EST
Monthly Mean = 0.15
Mean Low = -0.37
Mean High = 0.67
Mean Range = 1.04

Table 6: Water Levels, m NGVD

		Jul 1992			
Mid-Cycle Day	Time	Low	High	Mean	Range
1	400	—	—	—	—
1	1625	-0.54	0.78	0.16	1.32
2	450	-0.33	1.17	0.42	1.50
2	1715	-0.37	0.86	0.27	1.23
3	540	-0.41	0.90	0.25	1.31
3	1806	-0.55	0.79	0.15	1.34
4	631	-0.35	0.80	0.23	1.16
4	1856	-0.40	0.85	0.22	1.25
5	721	-0.25	0.69	0.24	0.94
5	1946	-0.41	0.78	0.18	1.19
6	812	-0.24	0.64	0.23	0.88
6	2037	-0.35	0.79	0.21	1.14
7	902	-0.23	0.57	0.17	0.80
7	2127	-0.32	0.74	0.17	1.06
8	952	-0.32	0.56	0.07	0.88
8	2218	-0.49	0.68	0.07	1.17
9	1043	-0.34	0.54	0.07	0.87
9	2308	-0.39	0.69	0.12	1.08
10	1133	-0.35	0.55	0.06	0.90
10	2358	-0.37	0.73	0.13	1.09
11	1224	-0.37	0.53	0.06	0.89
12	49	-0.31	0.70	0.17	1.01
12	1314	-0.37	0.61	0.06	0.98
13	139	-0.41	0.69	0.11	1.10
13	1404	-0.41	0.50	0.05	0.91
14	230	-0.35	0.76	0.18	1.11
14	1455	-0.38	0.52	0.09	0.90
15	320	-0.34	0.67	0.14	1.01
15	1545	-0.48	0.55	0.06	1.03
16	410	-0.25	0.80	0.26	1.05
16	1635	-0.29	0.65	0.20	0.94
17	501	-0.25	0.64	0.20	0.88
17	1726	-0.39	0.51	0.06	0.90
18	551	-0.30	0.61	0.13	0.91
18	1816	-0.36	0.57	0.09	0.93
19	641	-0.30	0.57	0.11	0.87
19	1907	-0.42	0.55	0.07	0.97
20	732	-0.21	0.50	0.16	0.71
20	1957	-0.33	0.56	0.12	0.89
21	822	-0.24	0.38	0.07	0.62
21	2047	-0.33	0.64	0.14	0.97
22	913	-0.23	0.65	0.20	0.88
22	2138	-0.35	0.74	0.16	1.09
23	1003	-0.37	0.42	0.01	0.79
23	2228	-0.43	0.74	0.21	1.17
24	1053	-0.18	0.47	0.16	0.65
24	2319	-0.32	0.75	0.22	1.07
25	1144	-0.27	0.50	0.13	0.78
26	9	-0.35	0.77	0.21	1.12
26	1234	—	—	—	—
27	59	—	—	—	—
27	1325	-0.39	0.67	0.15	1.06
28	150	-0.36	1.02	0.31	1.38
28	1415	-0.47	0.72	0.15	1.19
29	240	-0.52	0.92	0.20	1.44
29	1505	-0.62	0.72	0.06	1.34
30	331	-0.64	0.88	0.11	1.52
30	1556	-0.65	0.77	0.08	1.43
31	421	-0.63	0.89	0.09	1.52
31	1646	0.03	0.24	0.12	0.21

PART VII: NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Geodimeter surveying system; a Geodimeter 140-T self-tracking, electronic theodolite, distance meter, in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in June 1992 and the surveys in July 1992 on profile line 188, located 517 m south of the pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1992. Cross-hatched areas indicate changes to the annual envelope which occurred in July.

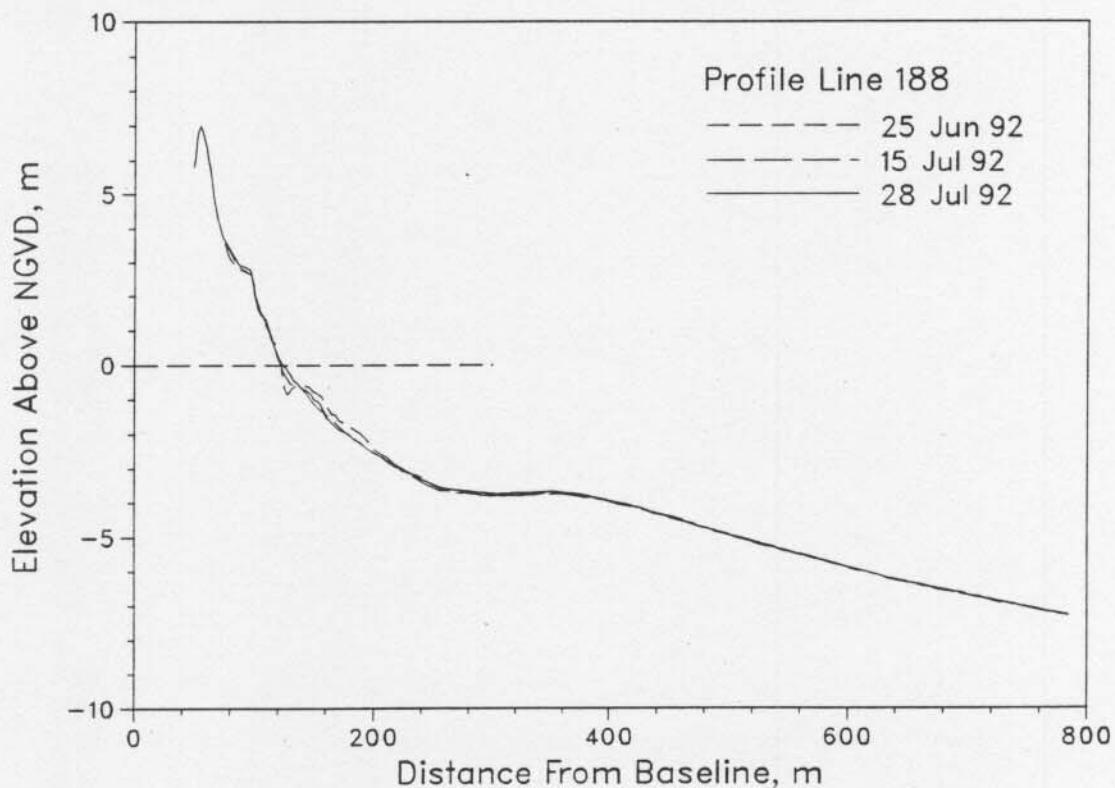


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

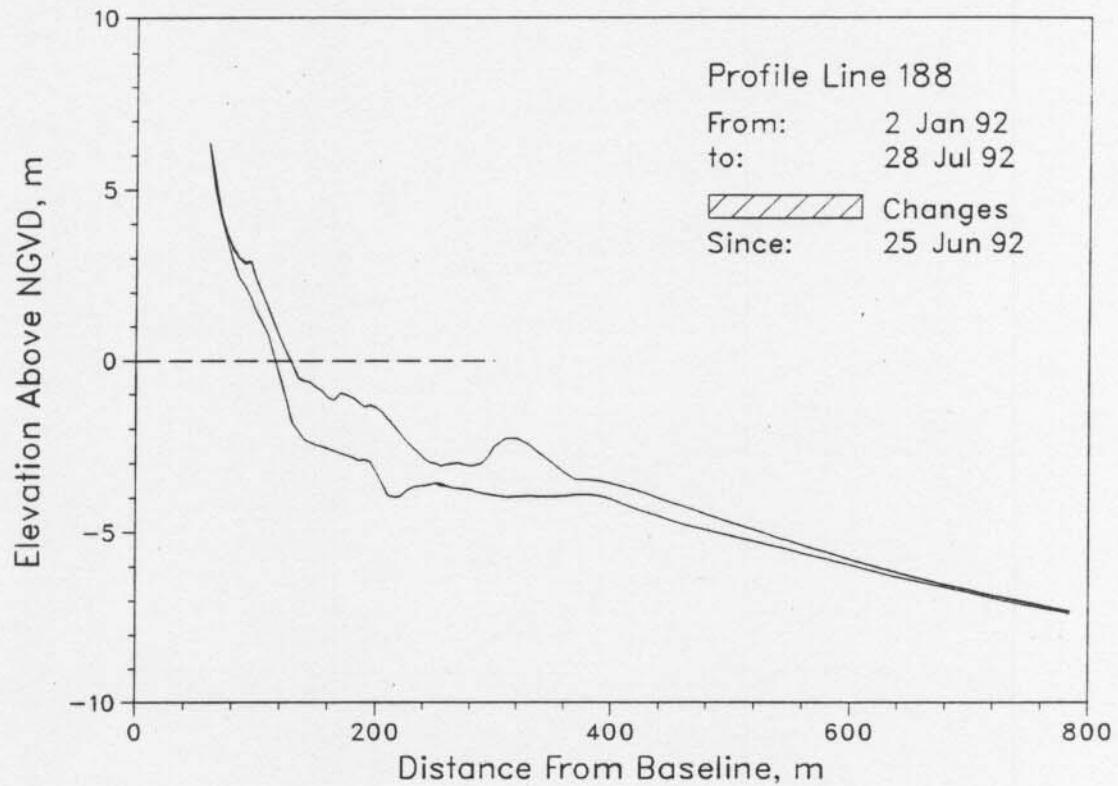


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey on 25 June. Wide contour lines on the change diagram represent eroded areas; thin lines indicate deposition.

Figure 7 is included for reference. There was no survey during the month of July.

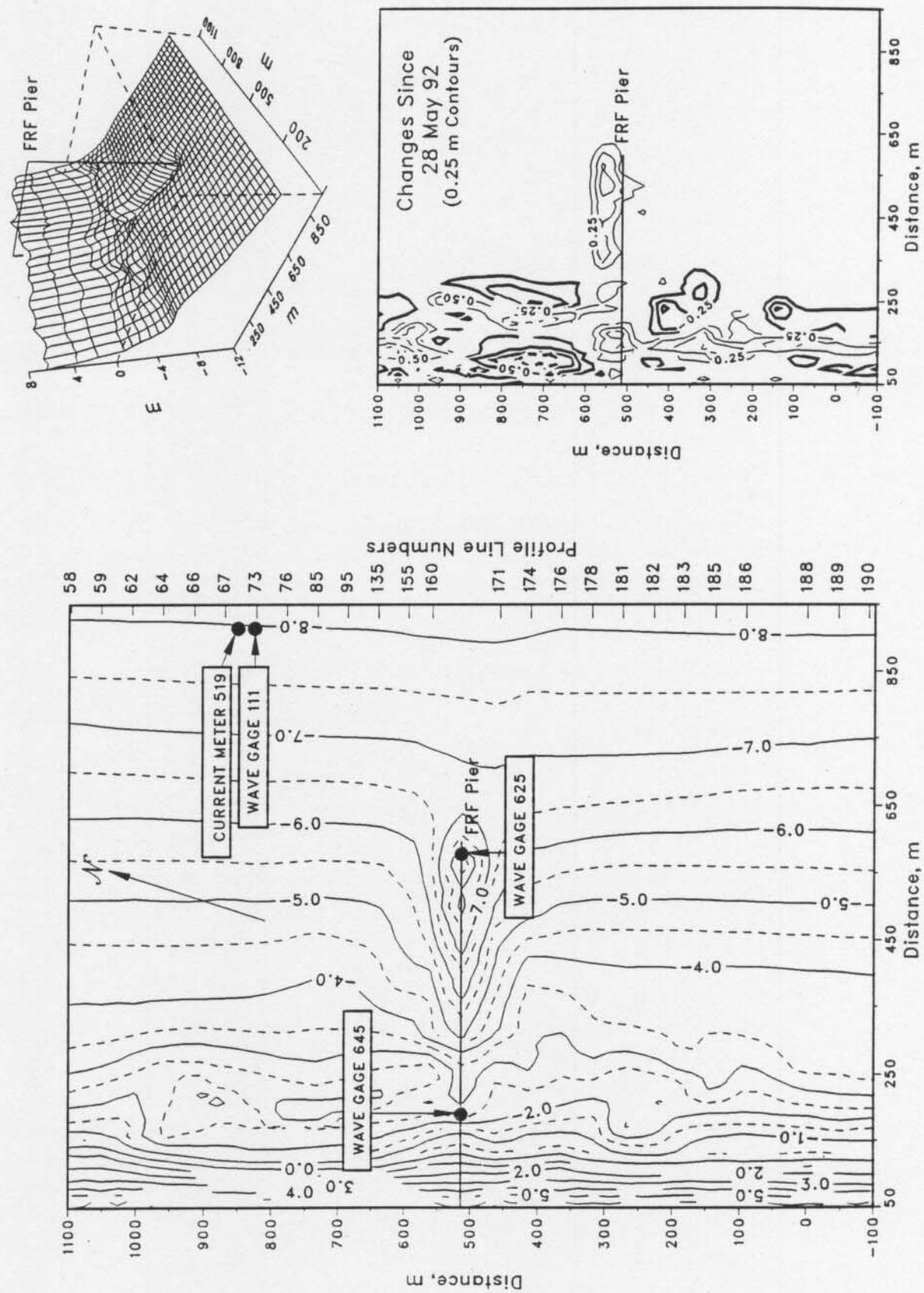


Figure 7. FRF bathymetry 25 Jun 92 depths relative to NGVD

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